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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/609,190	06/27/2003	Tajul Arosh Baroky	70030981-1	7614

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EXAMINER	
ROY, SIKHA	

ART UNIT	PAPER NUMBER
2879	

DATE MAILED: 03/01/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/609,190	BAROKY ET AL.	
	Examiner	Art Unit	
	Sikha Roy	2879	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 December 2005*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4 and 6-32* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4 and 6-32* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on December 20, 2005 has been entered.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1,2,4,6-11,15 -17,19-23, 25 and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,252,254 to Soules et al. and further in view of U.S. Patent 6,586,882 to Harbers.

Regarding claim 1 Soules discloses (column 2 lines 1-32) a light emitting device comprising a laser diode and a phosphor composition positioned to receive light (blue light) from the laser diode and capable of absorbing the light and emitting light at a wavelength longer than that (blue) emitted from the laser diode. Soules further discloses (column 4 lines 10-24) the phosphor composition comprising first type of phosphor

particles emitting red light and second type of phosphor particles emitting green light upon excitation from the blue-emitting LED.

Regarding claim 1 Soules does not exemplify first type of phosphor emitting red light comprising a material selected from CaS: Eu^{2+}, Mn^{2+}, (Zn,Cd)S: Ag^{+}, $Mg_4GeO_{5.5}F$: Mn^{2+} and ZnS: Mn^{2+}.

Harbers in pertinent art discloses suitable phosphor materials for converting blue light to red light is CaS: Eu^{2+}, Mn^{2+}. Harbers further teaches that these materials have a relatively high quantum efficiency and light absorption and have relatively very high lumen equivalent upon converting light from the first wavelength range to light of the second wavelength range.

Therefore it would have been obvious to use CaS: Eu^{2+}, $Mn^{2+}$for red emitting phosphor as suggested by Harbers in the phosphor composition of Soules for these phosphors having a relatively high quantum efficiency and light absorption, provide relatively very high lumen equivalent upon converting light from the first wavelength range to light of the second wavelength range.

Claim 32 essentially recites the same limitations as of claim 1 and hence is rejected for the same reason. The examiner notes that Soules discloses blue-emitting laser diode with only red and green emitting phosphor materials.

Regarding claim 2 Soules (column 2 lines 26,27) the light emitting device (phosphor composition and the light source together) producing white light.

Referring to claim 4 Soules discloses the first type (red color emitting phosphor) emits light having wavelength in the range of 600-630 nm.

Regarding claim 6 Soules discloses the second type of phosphors (column 4 lines 11-13) emits green light having wavelength in the range of 510-560 nm.

Regarding claim 7 Soules discloses the second type of phosphor particles comprising $Sr(Ga)_2S_4$: Eu^{2+}.

Regarding claim 8 Soules discloses the first type (red color emitting phosphor) emits light having wavelength in the range of 600-630 nm.

Regarding claim 9 Soules discloses phosphor composition emitting yellow light.

Regarding claims 10 and 11 Soules discloses (column 5 lines 53-65) the yellow phosphor emitting light in the wavelength range of 570-590 nm and comprising $Y_3Al_5O_{12}$: Ce^{3+}.

Regarding claim 15 Soules discloses (column 6 lines 15-27 Fig. 2) phosphor composition comprising clear polymer (such as polycarbonate) having phosphor particles suspended therein and the clear polymer matrix 15 is shaped as a lens, positioned to receive light from the laser diode and to direct light from the light emitting device.

Regarding claim 16 Soules discloses (column 5 lines 61-65) the phosphor composition comprising $SrS:Eu^{2+}$.

Regarding claim 17 Soules in view of Harbers disclose the phosphor composition comprises $(Zn, Cd)S:Ag^{+}$.

Claim 19 essentially recites the same limitations as of claim 7 and hence is rejected for the same reason.

Regarding claim 20 Soules discloses (column 2 lines 1-9) the light emitting device comprising phosphor composition with $Y_3Al_5O_{12}$: Ce^{3+}.

Regarding claim 21 Soules discloses (column 5 lines 56,57) the phosphor composition (red color-emitting phosphor) has an emission peak in the wavelength range of 600-650nm.

Regarding claim 22 Soules discloses the phosphor composition (green color-emitting phosphor) has an emission peak in the wavelength range of 530-555nm.

Regarding claim 23 Soules discloses (column 5 lines 52-56) the phosphor composition has an emission peak in the wavelength range of 570-590nm.

Referring to claim 25 Soules discloses (column 2 lines 112, claim 2) the light emitting device is a blue emitting laser diode.

Claims 1, 2,14, 25 - 27 are rejected under 35 U.S.C. 103(a) as being anticipated by U.S. Patent 6,294,800 to Duggal et al. and further in view of U.S. Patent 6,586,882 to Harbers.

Regarding claim 1 Duggal discloses (column 3 lines 45-62, column 4 lines 54-67) a lamp comprising laser diode and a phosphor composition positioned to receive ultraviolet light (254 nm) emitted from the laser diode and absorbing the light and converting the light into a longer wavelength in visible range. Duggal further discloses (column 7 lines 32-45) the phosphor composition comprises first type of particles emitting red light and second type of particles emitting green light upon excitation.

Regarding claim 1 Duggal does not exemplify first type of phosphor comprising a material selected from CaS: Eu^{2+}, Mn^{2+}, (Zn,Cd)S: Ag^{+}, $Mg_4GeO_{5.5}F$: Mn^{2+} and ZnS: Mn^{2+}.

Harbers in pertinent art discloses suitable phosphor materials for converting blue light to red light is CaS: Eu^{2+}, Mn^{2+}. Harbers further teaches that these materials have a relatively high quantum efficiency and light absorption and have relatively very high lumen equivalent upon converting light from the first wavelength range to light of the second wavelength range.

Therefore it would have been obvious to use CaS: Eu^{2+}, $Mn^{2+}$for red emitting phosphor as suggested by Harbers in the phosphor composition of Duggal for these phosphors having a relatively high quantum efficiency and light absorption provide relatively very high lumen equivalent upon converting light from the first wavelength range to light of the second wavelength range.

Regarding claim 2 Duggal discloses (column 5 lines 34-36) the device generates bright white light.

Regarding claim 14 it is clearly evident from Fig. 6 of Duggal that phosphor composition 250 is disposed on the surface of a lens 230 to receive light from the laser diode 210.

Regarding claims 25,26 and 27 Duggal discloses (column 5 lines 3-11) the laser diode can be a blue or violet (radiation with wavelength between 330-420 nm) or UV laser diode (radiation with wavelength between 365-375 nm).

Claims 12 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,252,254 to Soules and U.S. Patent 6,586,882 to Harbers and further in view U.S. Patent 6,576,488 to Collins et al.

Regarding claim 12 Soules and Harbers do not exemplify the phosphor composition being a conformal coating on the surface of the laser diode.

Collins in pertinent art of light emitting semiconductor structure discloses (Fig.8A column 8 lines 20-35) conformal phosphor layer 12 formed on the LED chip 10. Collins further discloses (column 3 lines 1-3) this conformal coating of phosphor (with uniform thickness) produces uniform white light.

Therefore it would have been obvious to one of ordinary skill in the art the time of invention to modify the phosphor composition of Soules and Harbers by conformal coating as taught by Collins to produce uniform white light.

Regarding claim 13 Collins discloses (column 8 lines 34,35) the thickness of phosphor coating is about 15 μm to 100 μm.

Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,252,254 to Soules and U.S. Patent 6,586,882 to Harbers and further in view of U.S. Patent 6,654,079 to Bechtel et al.

Regarding claim 18 Soules and Harbers does not exemplify the light emitting device having the phosphor composition comprising a material selected from $Mg_4GeO_{5.5}F: Mn^{4+}$ and $ZnS:Mn^{2+}$.

Bechtel in pertinent art of phosphor layer for color display discloses (column 2 line 65 through column 3 line 4) red phosphor composition comprising $Mg_4GeO_{5.5}F$: Mn^{4+}. Bechtel further discloses the luminous intensity in the red range and the resultant optical efficiency achieved by means of this phosphor is very high.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to include $Mg_4GeO_{5.5}F$: Mn^{4+} in the phosphor composition of Soules and Harbers as suggested by Bechtel for providing high luminous intensity and optical efficiency of the light emitting device.

Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.s. Patent 6,252,254 to Soules, U.S. Patent 6,586,882 to Harbers and further in view of WO 03/005458 to Brunner et al. (U.S. Patent Application Publication 200/0188697 to Brunner et al.).

Regarding claim 24 Soules discloses (column 4 lines 23,24) the phosphor particles have preferred size of 2-5 micrometer. Soules fails to disclose phosphor particles having mean particle diameter in the range of 13 to 20 micrometer.

Brunner in same field of endeavor discloses ([0093]) the phosphor particle having a mean particle diameter between 2 and 20 micrometer is preferred. Brunner further explains that decreasing particle diameter the scattering of radiation at the particles increases and the conversion efficiency decreases and hence phosphors with preferred mean particle diameter between 2 and 20 micrometer provides less scattering and more efficient conversion of radiation.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to select the phosphor particle having mean particle diameter preferably between 2 and 20 micrometer as suggested by Brunner in the phosphor composition of Soules and Harbers for providing less scattering and more efficient conversion of radiation.

Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.s. Patent 6,252,254 to Soules and U. S. Patent 6,586,882 to Harbers and further in view of U.S. Patent 6,490,309 to Okazaki et al.

Claim 28 differs from Soules and Harbers in that Soules and Harbers do not exemplify the laser diode operated in pulse mode.

Okazaki in relevant field of laser diode discloses (column 10 lines 19-29) laser diode operated in pulse mode. Okazaki further discloses that high pulsed ultraviolet light can be obtained with high efficiency and high output power by driving the laser diode in a pulse mode.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to operate the laser diode of Soules and Harbers in a pulse mode as suggested by Okazaki so that high pulsed ultraviolet light can be obtained with high efficiency and high output power.

Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,252,254 to Soules et al. and further in view of U.S. Patent Application Publication 2004/0056256 to Bokor et al.

Regarding claim 29 Soules fails to disclose second type of phosphor comprising ZnS:Cu, Al.

Bokor in analogous field of illumination device discloses ([0001], [0030]) white light emitting diode having green emitting phosphor ZnS:Cu, Al. Bokor further teaches these phosphors are easy to process in the vicinity of LEDs.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to use green emitting phosphor ZnS:Cu, Al as taught by Bokor for the green phosphor material of Soules for the benefit of easy processing of these phosphors in the vicinity of LEDs.

Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,252,254 to Soules et al. and further in view of U.S. Patent Application Publication 2004/0056256 to Bokor et al. and further in view of U.S. Patent 6,576,488 to Collins et al.

Referring to claim 30 Soules and Bokor fail to disclose the phosphor composition being a conformal coating which does not vary by more than 20%.

Collins in the same field of endeavor discloses (column 3 lines 61 through column 4 line 16, column 8 lines 20-35 Fig. 8A) a light emitting device comprising a multilayer laser diode (general formula $Al_xGa_yIn_{1-x-y}N$) and conformal coating of

phosphor composition 12 positioned to receive light emitted from the laser diode, absorbing the light and emitting light at a longer wavelength (white light) wherein the variation in thickness of conformal coating of phosphor is less than 10%. Collins discloses (abstract) this conformal coating with variation of less than 10% produces substantially uniform white light.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to apply the phosphor composition of Soules and Bokor in a conformal coating with variation of less than 10% as suggested by Collins for producing substantially uniform white light.

Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent 6,252,254 to Soules et al. and further in view of U.S. Patent Application Publication 2004/0056256 to Bokor et al. and further in view of WO 03/005458 to Brunner et al. (U.S. Patent Application Publication 2004/0188697 to Brunner et al.)

Soules and Bokor fail to disclose phosphor particles having mean particle diameter in the range of 13 to 20 micrometer.

Brunner in same field of endeavor discloses ([0093]) the phosphor particle having a mean particle diameter between 2 and 20 micrometer is preferred. Brunner further explains that decreasing particle diameter the scattering of radiation at the particles increases and the conversion efficiency decreases and hence phosphors with preferred mean particle diameter between 2 and 20 micrometer provides less scattering and more efficient conversion of radiation.

Therefore it would have been obvious to one of ordinary skill in the art at the time of invention to select the phosphor particle having mean particle diameter preferably between 2 and 20 micrometer as suggested by Brunner in the phosphor composition of Soules and Bokor for providing less scattering and more efficient conversion of radiation.

Response to Arguments

Applicant's arguments with respect to claims 1 and 29 have been considered but are moot in view of the new ground(s) of rejection.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sikha Roy whose telephone number is (571) 272-2463. The examiner can normally be reached on Monday-Friday 8:00 a.m. – 4:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar D. Patel can be reached on (571) 272-2457. The fax phone number for the organization is (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Sikha Roy

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